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FRAMES FILTERING WITH RANDOM PIXEL'S INCREMENT AND DECREMENT APPROACH IN AN VIDEO ENHANCEMENT

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ABSTRACT

Video enhancement has played very important roles in many applications. However, most existing enhancement methods only focus on the spatial quality within a frame while the temporal qualities of the enhanced video are often unguaranteed. In this paper, a new algorithm is proposed for video enhancement.

The proposed algorithm introduces new temporal constraints and combines them with spatial constraints such that both the spatial and temporal qualities of the video can be improved. Two strategies are proposed for including the temporal constraints. Experimental results demonstrate the effectiveness of the proposed algorithm.

KEYWORDS: Image Enhancement, Video Enhancement, Frames, Sound Quality, MSE

INTRODUCTION

Video enhancement is of increasing importance in many applications such as medical services, display processing, texture analysis, surveillance, and scientific visualization [2, 9-12].

Many researchers have been done on video or image enhancement [1-10]. Many works perform enhancement based on histogram equalization (HE) such that the contract of the image can be improved [1, 3-6]. Since pure HE may often lead to unnatural affects in the image, various HE-modification methods are proposed which introduce spatial constraints to reduce these unnatural effects [3-6]. Other works [3, 10] select some appealing images as the examples and perform enhancement based on these example images.

However, most of the existing enhancement algorithms only focus on improving the spatial qualities with a single frame or an image. They are not suitable for enhancing videos since the temporal quality consistencies among frames are not guaranteed.

There are some works proposed for enhancing videos under some specific applications. For example, Liu et al. [10] propose a learning-based method for videoconferencing where frames share the same tone mapping function if their backgrounds do not change by much. Although this method can achieve good temporal quality in video conferencing scenarios, it cannot be extended to other scenarios since there are many videos whose backgrounds or contents are changing frequently. Furthermore, Mangiest al. [9] uses two cameras with different exposures to create high-dynamic-range frames. However, this method has

Specific system requirements and thus cannot be easily used in other scenarios. Therefore, it is desirable to develop a more generalized enhancement algorithm which can handle the temporal quality of various videos.

In this paper, a new Temporal-Constraint-Based (TCB) Algorithm is proposed for video enhancement. The proposed TCB algorithm introduces new temporal constraints and combines them with spatial constraints such that both the spatial and the temporal qualities of videos are improved. Two different strategies are proposed for defining and integrating the temporal constraints. The proposed algorithm provides a generalized way for handling the video temporal qualities. Experimental results demonstrate the effectiveness of our proposed algorithm.

There are two main methods to process an image as defined by the domain in which the image is processed, namely spatial-based domain and frequency-based domain. Spatial based domain refers to the image plane itself, and approaches in this category are based on direct manipulation of pixels in an image. Frequency-based domain processing techniques are based on modifying the spatial frequency spectrum of the image as obtained by transform.

Enhanced techniques based on various combinations of methods from these two categories are not unusual and the same enhancement technique can also be implemented in both domains, yielding identical results. With the same image processing, a lot of video. Enhancement methods have been proposed. However, in all of these methods, there still are no general standards, which could be used as a design criterion of video enhancement algorithms. There is also no general unifying theory of video enhancement. The survey of available techniques is based on the existing techniques of video enhancement, which can be classier into two broad categories: spatial-based domain video enhancement and transform-based domain video enhancement [1, 9-14]. Spatial-based domain video enhancement operates directly on pixels. The main advantage of spatial-based domain technique is that they are conceptually simple to understand, and the time complexity of these techniques is low which favors real time implementations. But these techniques generally lacks in providing adequate robustness and imperceptibility requirements. A survey of spatial-based domain enhancement techniques can be found in [4, 15-18]. Transform based domain video enhancement is a term used to describe the analysis of mathematical Functions or signals with respect to frequency, and operate directly on the transform coefficients of the image, such as Fourier transform, discrete wavelet transforms (DWT), and discrete cosine transforms (DCT) [1, 13-14, 18-20]. The basic idea in using this technique is to enhance the video by manipulating the transform coefficients. The advantage of transform-based video enhancement include (i) Low complexity of computations, (ii)Ease of viewing and manipulating the frequency composition of the image, and (iii) the easy applicability of special transformed domain properties. The basic limitations including (i) it cannot simultaneously enhance all parts of the image very well, and (ii) it is difficult to automate the image enhancement procedure.

LITERATURE SURVEY

Different genetic approaches have been applied for images/videos contrast enhancement [36]. [37] Uses a local enhancement technique. Genetic algorithms are meta-heuristic optimization techniques based on natural theory and survival of the fittest. [32] Uses a simple chromosome structure and genetic operators to increase the visible details and contrast of low illumination images especially with high dynamic range. In particular the enhancement of very dark and blurred images has been of particular interest as many aspects of these images are ambiguous and uncertain [38]. The method based on transform function that stretches the occupied gray scale range for the image secondly the transformation function is optimized using genetic algorithms with respect to the test image.

Tone mapping is another approach contrast enhancement technique. In this method, if we want to output high dynamic range (HDR) image on paper or on a display, we must somehow convert the wide intensity range in the image to

the lower range supported by the display [39]. However, most LCD or CRT displays and print-outs have low dynamic range. Tone mapping technique used in image processing and computer graphics to map asset of colors to another, often approximate the appearance of high dynamic range images in media with a more limited dynamic range. Tone mapping is done in the luminance channel only and in logarithmic scale. It is used to convert floating point radiance map into 8-bit representation for rendering applications.

The two main aims of tone mapping algorithm: preserving image details and providing enough absolute brightness information in low dynamic range tone mapped image. The existing techniques of tone mapping can be classified into categories: global tone mapping and local tone mapping. Global tone mapping function is based on logarithmic compression of luminance. It is a need to map the large range into a range that can be displayed given a HDR image with dynamic range spanning many orders of magnitude. Simple mapping methods, such as the function y = x=(x; y) will map a range of x = [0; 8) to the range x = [0; 1).

This method is considered a local operator since the operation only affects pixel values in an image individually on a pixel-by-pixel basis and each pixel is mapped in the someway. The global are independent of local spatial context. It performs the same operation on each pixel and don't work well when illumination varies locally. The simplest tone reproduction is a linear mapping which scales the radiances to the range between 0 and 255. The logarithm of the radiances is taken and linearly scaled to [0, 255]. Tone mapping algorithm designed for high contrast images is widely accepted. Multipass-based technique first estimates local adaptation level, and applies simple tone mapping function to it, and then puts back image details. The approach follows functionality of human visual system

(HVS) without attempting to construct its sophisticated model. The definition local contrast C at a pixel is as follows.

$$C(x,y) = L(x,y)/La(x,y) - 1$$

Where L is pixel luminance and La is local adaptation level, which we take to be just an average luminance over some neighborhood around pixel position (x; y).

Gradient-based domain tone mapping algorithm is used to display high dynamic range video sequences in low dynamic range devices. [40] Obtain a pixel wise motion vector field and incorporates the motion information into the Poisson equation. Then, by attenuating large spatial gradients, the algorithm can yield a high-quality tone mapping result without flickering artifacts. Tone mapping technique can adjust image or video content for optimum contrast visibility taking into account ambient illumination and display characteristics.

Table 1: Survey of Video Enhancement

Author	Year	Operating domain	Model	processing techniques	application
Agaian SS[1]	2007	Spatial domain	HE-based Logarithmic transform LTHS	log-reduction zonal magnitude technique; Logarithmic transform histogram shifting	Traffic monitoring;Security Surveillance;
Hao Hu[4]	2010	Spatial domain Transform	Content adaptive video processing model	Content classification and adaptive processing	Computer vision
Tarik Arici[10]	2009	Spatial domain	HE-based modification	Histogram modification framework, content-adaptive algorithm	LCD display device;Low quality video
Sungkwan Lee[13]	2007	Spatial domain Transform domain	Dynamic range compression	Discrete cosine transform(DCT); Retinex theory;	Image/video compressing;
Viet Anh Nguyen[19]	2009	Transform domain	Cauchy distribution model, AC transform coefficient	Video reconstructed from multiple compressed copies of video content	Compression video
R.C. Gonzalez [21]	2008	Spatial domain Transform domain	HE	Global Histogram Equalization; Histogram specification technique	Image/video; Security surveillance
Xuan Dong[23]	2010	Spatial domain	Image inverting model	Inverting the input low-lighting video; de-haze algorithm	Traffic monitoring;Medical images
Shan Du[24]	2010	Spatial domain	ARHE model	Adaptive Region-based Method	Face Recognition
A. A. Wahid. M[25]	2007	Spatial domain	Dynamic histogram equalization(DHE)	Dynamic Histogram Equalization technique	Medical image; Low quality video
Boukos, A. C[30]	2008	Spatial domain	2DTKEO model	2D Teager-Kaiser Energy Operator technique	Medical image; Satellites image;
David Menotti[31]	2007	Spatial domain	MHE model	Multi-histogram equalization methods	Image processing; Computer vision;
Sara Hashemi[32]	2010	Spatial domain	Improve HE	Genetic algorithms	High dynamic range image processing
George D[33]	2009	Spatial domain	Improve HS and HE	Histogram-based video enhancement technique	Image processing
Jafar.I [35]	2007	Spatial domain	ALHS Model	Automatic Specification of Local Histograms	Image processing; low quality video
Abhijit Mustafi [36]	2009	Spatial domain	Optimally enhance model	Genetic algorithms	Image processing; low quality video

High dynamic range imaging (HDRI or just HDR) is a set of techniques that allow a greater dynamic range of luminances between the lightest and darkest areas of an image than standard digital imaging techniques or photographic methods. This wider dynamic range allows HDR images to more accurately represent the wide range of intensity levels found in real scenes, ranging from direct sunlight to faint starlight [15]. However, the dynamic range in real-world environments

Figure 1: Video Frames

Thus far exceeds the range represented in 8-bit per-channel texture maps. Extended dynamic range can be reached by combining multiple images of the same scene taken with different, known exposure times. The result is a floating point radiance map with radiance values being proportional to those observed in the real scene. The two main sources of HDR imagery are computer renderings and merging of multiple photographs, which in turn are known as low dynamic range (LDR) [39].

PROPOSED METHODOLOGY

Proposed Algorithm

- Select an AVI video
- Check for its Header.
- If uncompressed then go to step 4 else go to step 8.
- Split video into frames and sound.
- Enhance Frames and sound (Optional).
- Create video from enhance frames.

- Embed sound into newly created video.
- stop

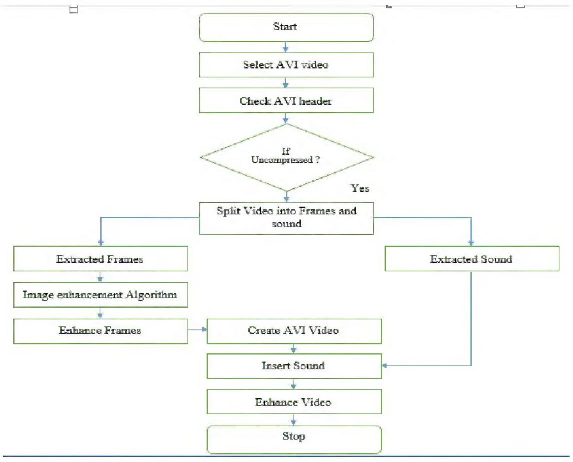

Figure 2: Data Flow Diagram (Proposed System)

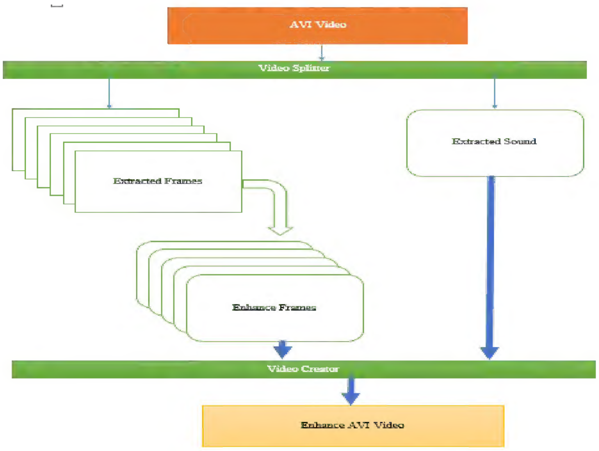

Figure 3: Proposed System Architecture

Image Enhancement

Algorithm

- Select an Image
- Read Image pixels.
- Modify an Image pixels components (Red, Green and Blue) with an Equation

  $\boldsymbol{Pnew} = \int(\boldsymbol{Pr}||\boldsymbol{Pg}||\ \boldsymbol{Pb}) * \boldsymbol{Ef} + \boldsymbol{Biase}$ Eq………3.2.1
- If Pnew>255 || Pnew<0 then discard pixels and set its original value as new Pixel value.
- Repeat step 3 to 4 until all pixels are scanned.
- Stop

The quality of an image is examined by objective evaluation as well as subjective evaluation. For subjective evaluation, the image has to be observed by a human expert. But the human visual system is so complicated and this cannot

give the exact quality of image. There is various metrics used for objective evaluation of an image. Some of them are mean square error (MSE), root mean squared error (RMSE), mean absolute error (MAE) and peak signal to noise ratio (PSNR).

Mean Square Error (MSE) is given as

Mean Square Error (MSE) is given as

$$MSE = \sum_{i=1}^{m}\sum_{j=1}^{n}(\overline{A}(m,n) - A(m,n))^2$$

Mean Absolute Error is defined as

$$MAE = \sum_{i=1}^{m}\sum_{j=1}^{n}|\overline{A}(m,n) - A(m,n)|$$

Peak signal to noise ratio (PSNR) is defined in logarithmic scale in db. It is a ratio of peak signal power to noise power. Since the MSE represents the noise power and the peak signal power, the PSNR is defined as

$$PSNR = 10 * \log 10(1/MSE)$$

This image metric is used for evaluating the quality of a filtered image and thereby the capability and efficiency of a filtering process. In addition to these metrics, universal quality index (UQI) is extensively used to evaluate the quality of an image now-a-days. Further, some parameters, e.g. method noise and execution time are also used in literature to evaluate the filtering performance of a filter [14-15].

EXPERIMENT RESULTS

Table 2

Sr.No	Image Size	Result Image Size	PSNR
1	100 X 100	100 X 100	70.57
2	150 X 150	150 X 150	75.2143
3	200 X 200	200 X 200	80.237
4	250 X 250	250 X 250	67.2382
5	300 X 300	300 X 300	76.2342

Table 3

Sr.No	Image Name	Size	Mean Intensity	Entropy	Enhance Image Size	Mean Intensity	Entropy
1	1.jpg	100x100	0.5	17.35	100x100	0.43	17.62
2	2.jpg	150x150	0.4	18.24	150x150	0.478	18.23
3	3.jpg	200x200	0.5	17.352	200x200	0.5	17.987
4	4.jpg	250x250	0.6	18.234	250x250	0.6234	18.464

Figure 4: Input Video Frame

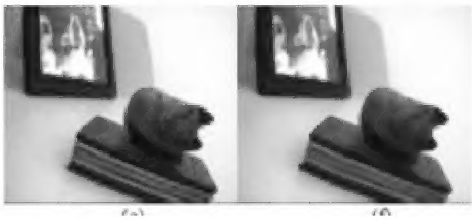

Figure 5: Output Video Frame

CONCLUSIONS

This proposed video enhancement framework consisting of Bilateral Tone adjustment and SWCE. SWCE method integrates the saliency map with a simple contrast enhancement, and also performs more enhancements in regions that humans give more attention. This work showed that SWCE achieves greater performance using luminance component. To evaluate the enhancement performance, the PSNR value was used to measure the quality of enhancement. This technique will also prove that enhancing the quality of low-grade video surveillance cameras.

REFERENCES

1. S. S. Agaian, S. Blair and K. A. Panetta, Transform coefficients histogram-based image enhancement algorithms using contrast entropy, IEEE Trans. Image Processing, vol. 16, no. 3, pp. 741-758, 2007.
2. YunBo Rao, W. Lin and L. T. Chen, Image-based fusion for video enhancement of nighttime surveillance, Optical Engineering Letters, vol. 49, no. 2, pp. 120501-1- 120501-3, 2010.
3. A. Ilie, R. Raskar and J. Yu, Gradient domain context enhancement for fixed cameras, International Journal of Pattern Recognition and Artificial Intelligence, vol. 19, no. 4, pp. 533-549, 2005.
4. H. Hu, Video enhancement: content classification and model selection, Ph. D. Thesis, Technique Universities Eindhoven, Eindhoven, Netherlands, 2010.
5. P.Y Liu, K.B Jia, Research and Optimization of Low-Complexity Motion Estimation Method Based on Visual Perception, Journal of Information Hiding and Multimedia Signal Processing, vol. 2, no.3, pp. 217-226, 2011.
6. T. Wan, T. George, T. Panagiotis, C. Nishan and A. Alin, Context enhancement through image fusion: a multi-resolution approach based on convolution of Cauchy distributions, Proc. of the IEEE International Conference on Acoustics, Speech and Signal Processing, pp. 1309-1312, 2008.
7. Y. Cai, K. Huang, T. Tan and Y. Wang, Context enhancement of nighttime surveillance by image fusion, Proc. of the IEEE 8th International Conference on Pattern Recognition, pp. 980-983, 2006.
8. J. Li, Z.li Stan, P. Quan and Y. Tao, Illumination and motion-based video enhancement for night surveillance, Proc. of the IEEE 2nd International Workshop on Visual Surveillance and Performance Evaluation of Tracking and Surveillance, pp. 169-175, 2005.
9. J. Li, Y. Tao, P. Quan and Y. Cheng, Combining scene model and fusion for night video enhancement, Journal of Electronics, vol. 26, no. 1, pp. 88-93, 2009.
10. YunBo Rao and Leiting Chen, An efficient contourlet transform-based algorithm for video enhancement, Journal of Information Hiding and Multimedia Signal Processing, vol. 2, no. 3, pp. 282-293,2011.
11. V. Kastrinaki, M. Zervakis and K. Kalaitzakis, A survey of video processing techniques for traffic applications, Image and Vision Computing, vol. 21, pp. 359-381, 2003.
12. R. Jafri and H. R. Arabnia, A survey of face recognition techniques, Journal of Information Processing Systems, vol. 5, no. 2, pp. 41-68, 2009.

13. S. Lee, An efficient content-based image enhancement in the compressed domain using Retinex theory, IEEE Trans. Circuits and Systems for Video Technology, vol. 17, no. 2, pp. 199-213, 2007.

14. K. Junga, K. Kimb and A. K. Jainc, Text information extraction in images and video: a survey, Pattern Recognition, vol. 37, pp. 977-997, 2004.

15. E. P. Bennett and L. McMillan, Video enhancement using per-pixel virtual exposures, ACM Trans. Graphics, vol. 24, no. 3, pp. 845-852, 2005.

16. E. P. Bennett, J. L. Mason and L. McMillan, Multispectral bilateral video fusion, IEEE Trans. Image Processing, vol. 16, no. 5, pp. 1185-1194, 2007.

17. G. Mittal, S. Locharam, S. Sasi, G. R. Shaffer and A. K. Kumar, An efficient video enhancement method using LA*B* analysis, Proc. of IEEE International Conference on Video and Signal based Surveillance, pp. 66-71, 2006.

18. Yunbo Rao, Zhongho Chen, Ming-Ting Sun, Yu-Feng Hsu and Zhengyou Zhang, An effective night video enhancement algorithm, Visual Communications and Image Processing, pp. 1-4, 2011.

19. V. A. Nguyen, Y. P. Tan and Z. H. Chen, On the method of multicopy video enhancement in transform domain, Proc. of the 16th IEEE International Conference on Image Processing, pp. 27772780, 2009.

20. S. Walid and A. Ibrahim, Real time video sharpness enhancement by wavelet-based luminance transient improvement, Proc. of the 9th International Symposium on Signal Processing and Its Applications, pp. 1- 4, 2007.